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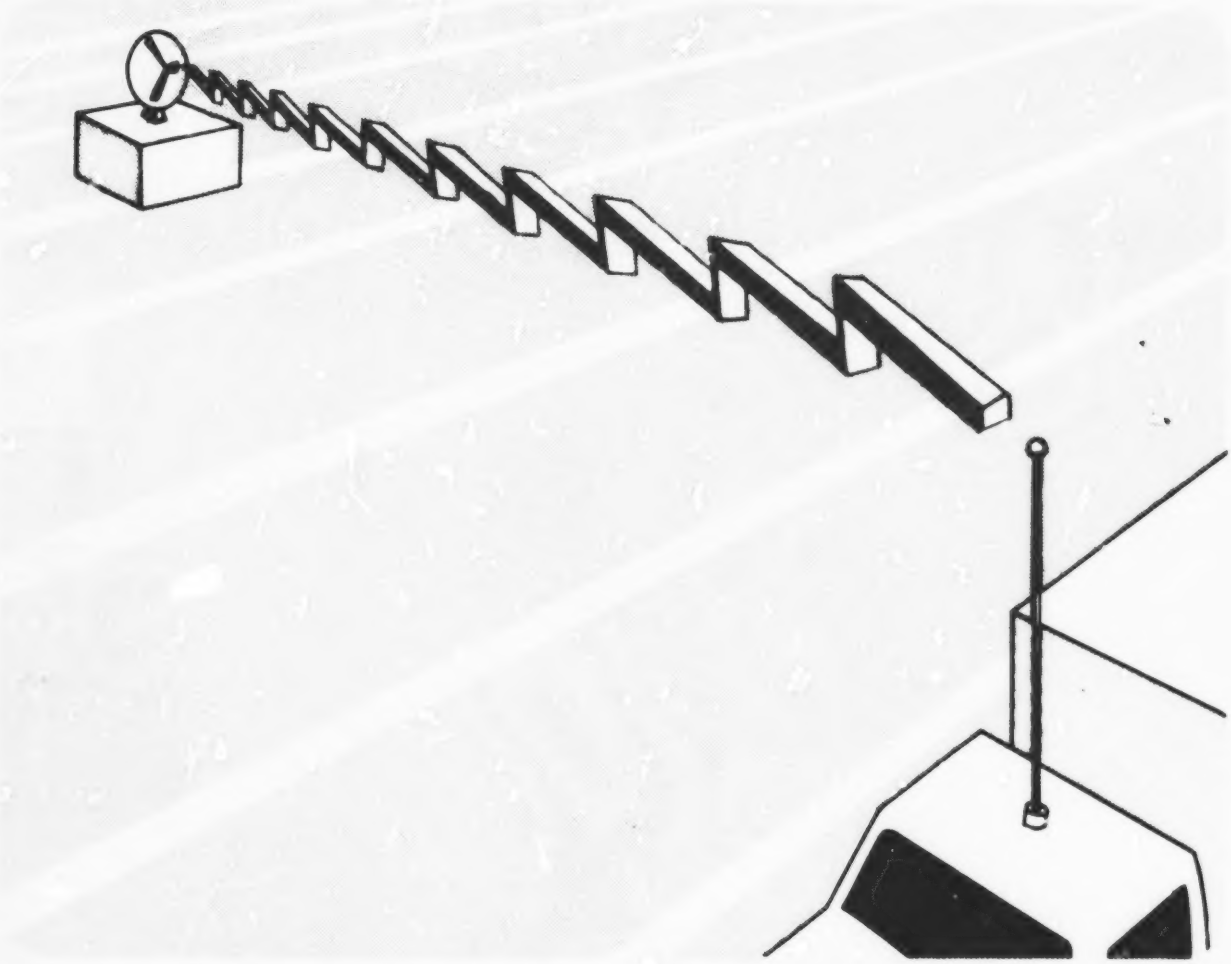
Maintenance Manual
Portable Antennas



ORIGINAL

COMPLETED

MAINTENANCE MANUAL

PORTABLE ANTENNAS

Federal Emergency
Management Agency

Maintenance Manual
Portable Antennas

Introduction

The purpose of this manual is to guide you on how to maintain portable antennas. The information in this manual is only a **supplement** to the recommended maintenance information contained in the manufacturer's service manual. **Always follow the maintenance procedures described in the manufacturer's manual.** This manual will help you understand why maintenance is necessary. This manual will also be helpful if the manufacturer's manual is not immediately available.

Description of Portable Antennas

Antennas are metallic rods or wires used to send and receive radio waves. When an antenna receives a radio signal, it converts it to an electrical current that the receiver can process when it is set for receiving. When an antenna sends a radio signal, it converts the electrical impulse from the transmitter into a radio wave.

Antennas are simple devices that appear in a wide variety of shapes and sizes. Nevertheless, they are perhaps the most important part of a portable radio station's system. The performance of any radio is highly dependent on the radio's antenna to pick up and send signals.

There are many types of antennas for use with mobile radios. The following is a list of popular types:

Type of Antenna

Low-band ground plane
Low-band coaxial
Low-band loaded whip
Low-band 1/4-wave whip
Low-band 5/8 (or 1/2) whip

UHF-band ground plane
UHF-band coaxial
UHF-band 1/4-wave whip
UHF-band mobile gain
UHF-band fixed gain

High-band ground plane
High-band coaxial
High-band 1/4-wave whip
High-band 5/8-wave whip

The most common mobile antenna is called a Marconi antenna. It is a vertical whip antenna, one-quarter of a wavelength in length. It utilizes the vehicle body as its ground plane. For high band (150-170 MHz), which most public works departments use, a Marconi antenna with a whip about 18 in. long is used. This antenna is mounted in the center of a vehicle's metal roof. For ultra-high frequencies (300-400 MHz), which more and more police and fire departments are using, a Marconi antenna with a whip 6 in. long is used. It should be mounted in the center of the vehicle's roof. For both the high and ultra-high frequencies, the whip length can be trimmed for optimum performance at a given frequency.

The mobile antenna system consists of the antenna itself and the coaxial cable that connects the antenna to the transmitter and receiver. The coaxial cable serves as the transmission line between the radio and the antenna. **The cable should be one continuous length; splices should be avoided.** If it is necessary to connect two separate pieces of cable, suitable splicing connectors should be used. **Avoid damaging the cable; changes in the shape of the cable will lead to problems receiving or sending messages.**

Preventive Maintenance

To ensure that your equipment works in an emergency, you should **regularly check the antennas, the antennas' mountings, cable routing, and the connecting cables to spot small troubles before they become big problems.** Monthly, semiannual, annual, and biennial maintenance checks prevent serious problems from suddenly happening.

Routinely examine the equipment. Check for frayed connections, loose nuts and bolts, and damage to the cable. These checks are not normally mentioned in manufacturer's manuals, but can lead to more serious problems.

Equipment and Spare Parts

Only ordinary mechanical and electrical tools are necessary to keep your equipment in top shape. To perform some maintenance tasks, you may also need an ohmmeter and a rf through-line watt meter.

Portable antennas require few spare parts. Because antenna systems are so inexpensive, it is often quite reasonable to replace the entire unit rather than waste time trying to isolate a problem. The following is a sample spare parts table.

Parts on hand for 100 mobile antennas

Names of parts	Quantity
complete replacement antennas	4
proper connectors	10
anticorrosion silicone compound	1 pint
coaxial cable RG58 A/U or manufacturer specified cable	50 feet

Safety

Proper safety precautions should be taken before attempting any maintenance work. There are no immediate safety hazards in working with portable antennas. Nevertheless, **follow safety precautions outlined in maintenance manuals provided by the manufacturer.**

Monthly Maintenance Checks

1) Check connection of whip to base of antenna mount.
2) Check connection of antenna to vehicle.
3) Clean the antenna, removing dirt, grease, and fungus.
4) With motor running, check for noise problems.

6-Month Maintenance Checks

1) Inspect connections. Make sure that they are watertight.
2) Apply anticorrosion silicone compound to any threaded areas and exposed connections.

12-Month Maintenance Checks

1) Visually inspect cable for kinks, bends, crushing, fraying, improper positioning or damage.
2) Check continuity between antenna and ground with ohmmeter.

24-Month Maintenance Checks

1) Check Voltage Standing Wave Resistance (VSWR) of antenna system to see if it is within specifications.

Corrective Maintenance: Troubleshooting

Some equipment malfunctions may be discovered during the operation or maintenance of your equipment. You should perform the tests on the following tables to correct the problem.

PLEASE NOTE: This manual does not attempt to list all possible malfunctions that could occur nor can we suggest all possible remedies. Consult the manufacturer's manual if a malfunction is not listed or it is not corrected by prescribed procedure.

Corrective Maintenance: Portable Antennas (part 1 of 2)

Malfunction	Possible Cause	Recommendation
1. Short transmit range: noisy reception	■ defective antenna system	■ disconnect antenna and insert test lead probe into antenna receptable (DO NOT TURN TRANSMITTER ON)
	■ broken connection	■ check all connections between radio and antenna
	■ leaky cable insulation; dirty play or antenna insulator	■ connect ohmmeter to receiver end of cable. A high resistance indicates break in outer cable. Replace cable or clean antenna insulator.
	■ antenna not properly grounded to vehicle body	■ make a positive ground between insulations and grounding point
	■ wrong antenna for band used	■ replace antenna and re-tune input circuits
2. Short transmit range: normal reception	■ antenna system mismatch	■ connect in-line rf watt-meter in series with antenna; measure VSWR and adjust transmitter for minimum VSWR. If VSWR cannot be reduced to less than 1.3:1, replace antenna or cable.

Corrective Maintenance: Portable Antennas (part 2 of 2)

Malfunction	Possible Cause	Recommendation
3. No transmit	■ electrical short in cable or connectors	■ connect ohmmeter to receiver end of cable. A low resistance indication confirms short. Replace cable or connectors as necessary.
4. Normal range: noisy reception	■ cable picking up electrical interference from car	■ check to see if cable insulation intact. Reroute cables away from other electrical cables. Correct source of interference.

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